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GRINNELL

SIMPLEX DRY-PIPE SYSTEM

Extends Sprinkler Protection



Quartz Bulb Head will be Standard

Meets Four Essentials

1. Dry-Pipe System without an Air Valve
2. Universal Water Supply
3. Simple Maintenance
4. Unusually Quick Operation

Secures Liberal Insurance Rate Reductions

GRINNELL  COMPANY

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GRINNELL

SIMPLEX DRY-PIPE SYSTEM

A new and simple type
of Sprinkler System
extending Automatic
Fire Protection to
many buildings where
Standard Systems are
not economically
possible.



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GRINNELL

SIMPLEX DRY-PIPE SYSTEM



Here is a new type of sprinkler system which should extend the benefits of automatic fire protection to many buildings which until now, for a variety of reasons, have been denied the safety and economy of adequate protection.

The Grinnell Simplex Dry-Pipe System is a common sense development based on a detailed study of sprinkler fires during the past ten years. This study showed that in many classes of risk, the great majority of fires were extinguished or controlled by a very few sprinkler heads. Common sense indicated that it was economic waste to provide water supplies capable of feeding an almost unlimited number of sprinklers when experience showed that 98% of all fires in certain selected risks were controlled by ten or less heads, and that 94% of all fires in the same risks were controlled by five or less heads. The details of this investigation are given in tabular form on page 12.

With this fundamental established, Grinnell engineers attacked the problem of designing the type of system best calculated to meet the usual maintenance conditions surrounding this sort of property. They found several essentials necessary to a thoroughly practical system having the widest application.

One was that the system must be of the dry-pipe type to prevent freezing.

Another, that the system must be independent of city water as a supply in order to meet conditions where an adequate supply is either unavailable or can only be obtained at heavy expense.

A third essential was absolute simplicity in maintenance because many of the properties needing this protection do not have men properly trained to look after equipments such as are ordinarily installed in large industrial buildings.

Grinnell inventors met these three essential requirements by the application of an entirely new principle to the already proven pressure tank supply. This prin-

*Extends
Sprinkler
Protection*

*Common
Sense
System*

*Invented
By Grinnell
Engineers*

*Three
Practical
Essentials*

*Entirely
New
Principle*

ciple was made effective through the design of the Simplex Discharge Fitting by means of which an ordinary pressure tank is made to serve as a supply to a dry-pipe system without the use of the usual differential dry-pipe valve. The maintenance of this type of dry-pipe system is so simple as not to require expert supervision.

Another essential of this ideal system was speed of operation so that fires would be automatically discovered and put out in the shortest possible time so that the limited water supply might be made fully effective. Grinnell has met this necessity in two ways. First:—by designing a dry-pipe system which is only a few seconds slower than an ordinary wet-pipe system. Second:—by making the Grinnell Quartz Bulb Head standard with the Simplex System. This new head operates at 135° as against 160° for the ordinary solder type head. This means a saving of seconds in any fire—and in most a saving of minutes.

These four essentials have been built into a system which is thoroughly Grinnell in quality, durability and reliability. After hundreds of exacting tests it has been approved by the Underwriters' Laboratories of Chicago. For the risks which it is designed to safeguard it will afford practically the same protection as the more expensive standard system which is engineered on the basis of rules and requirements for hazardous industrial properties.

*Unusually
Quick
Operation*

*Same
Protection
Less
Expense*

GRINNELL QUARTZ BULB SPRINKLER



"Betters the Best"

The new Quartz Bulb Head which is standard with the Simplex Dry-Pipe System is the outstanding invention in fire protection in this generation. Its superiority over the solder sealed head is six fold:—

- 1 Quicker to operate than the solder sealed head.
- 2 Its operating element is proof against corrosion, while metal parts can be lead coated for severe conditions.
- 3 Operates even when encrusted or "loaded".
- 4 Great factor of safety. Can withstand temperatures closer to its operating point than solder heads without affecting its future reliability. Can stand 1,000 lbs. water pressure.
- 5 Its operating temperatures are constant throughout the years. Solder heads even under normal conditions, grow less sensitive with time.
- 6 Its greater durability means lower maintenance expense.

*Insurance
Rate
Reductions*

Due to the wholly satisfactory protection afforded by the Simplex System in the kind of risk it is designed to protect, substantial insurance rate reductions are granted for its installation. Such savings applied against the lowered protection expense make it a very attractive financial proposition for many properties which until now have been unable to effect any material reduction in insurance costs without an unwarrantably large expenditure for a standard sprinkler system with the usual type of water supply or supplies.

*Safeguards
Life and
Property*

More important even than this financial aspect is the safety to property and life which this new Grinnell system makes possible in a variety of properties, such as club houses, colleges, churches, dwellings, hospitals, hotels, libraries, museums, office buildings, penal institutions, public buildings, restaurants, schools, tenements, retail stores, and other mercantile properties.

The various features of the Grinnell Simplex Dry-Pipe System, and its advantages as a special type of equipment for selected risks, are made clear in the following description of its construction and operation.

*1500 Gallon
Tank Usual*

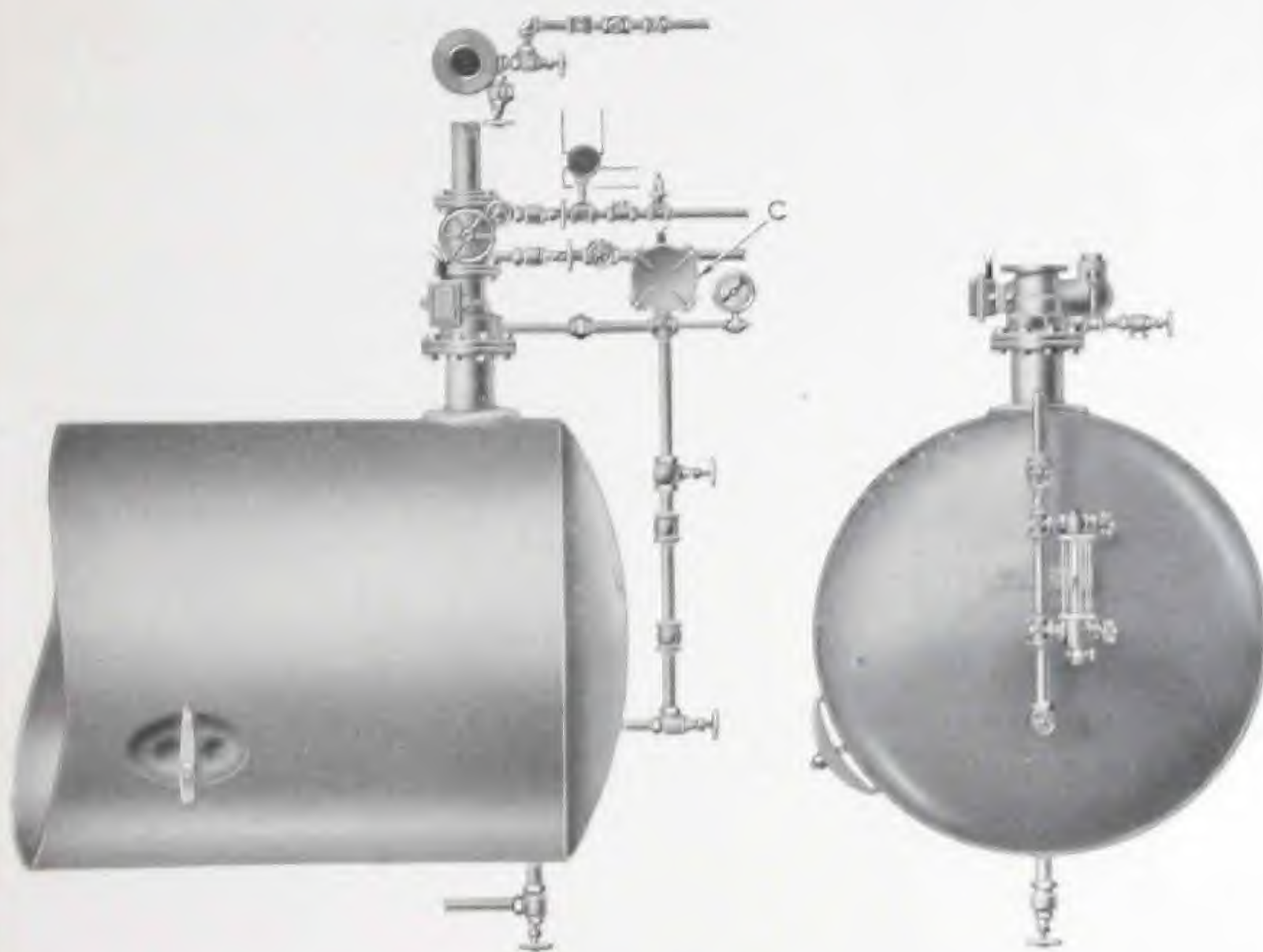
The general layout of the system is shown in Fig. 1 (Pages 6 and 7). The only automatic supply to the system is the pressure tank which is of a size suitable to the particular property to be protected. Probably 1500 gallon tanks, which are about 5 feet in diameter and 12 feet long, will be the most usual size. When practical this supply will, of course, be reinforced by a Fire Department Connection for fire department use.

*No
Dry-Pipe
Valve
Used*

After the tank is filled with water to the proper level, air is supplied from the automatic air compressor. This air is supplied partly to the sprinkler system proper and partly to the pressure tank through a restriction orifice in the Simplex Discharge Fitting. This balanced pressure holds the water in the tank and there is none in the piping.

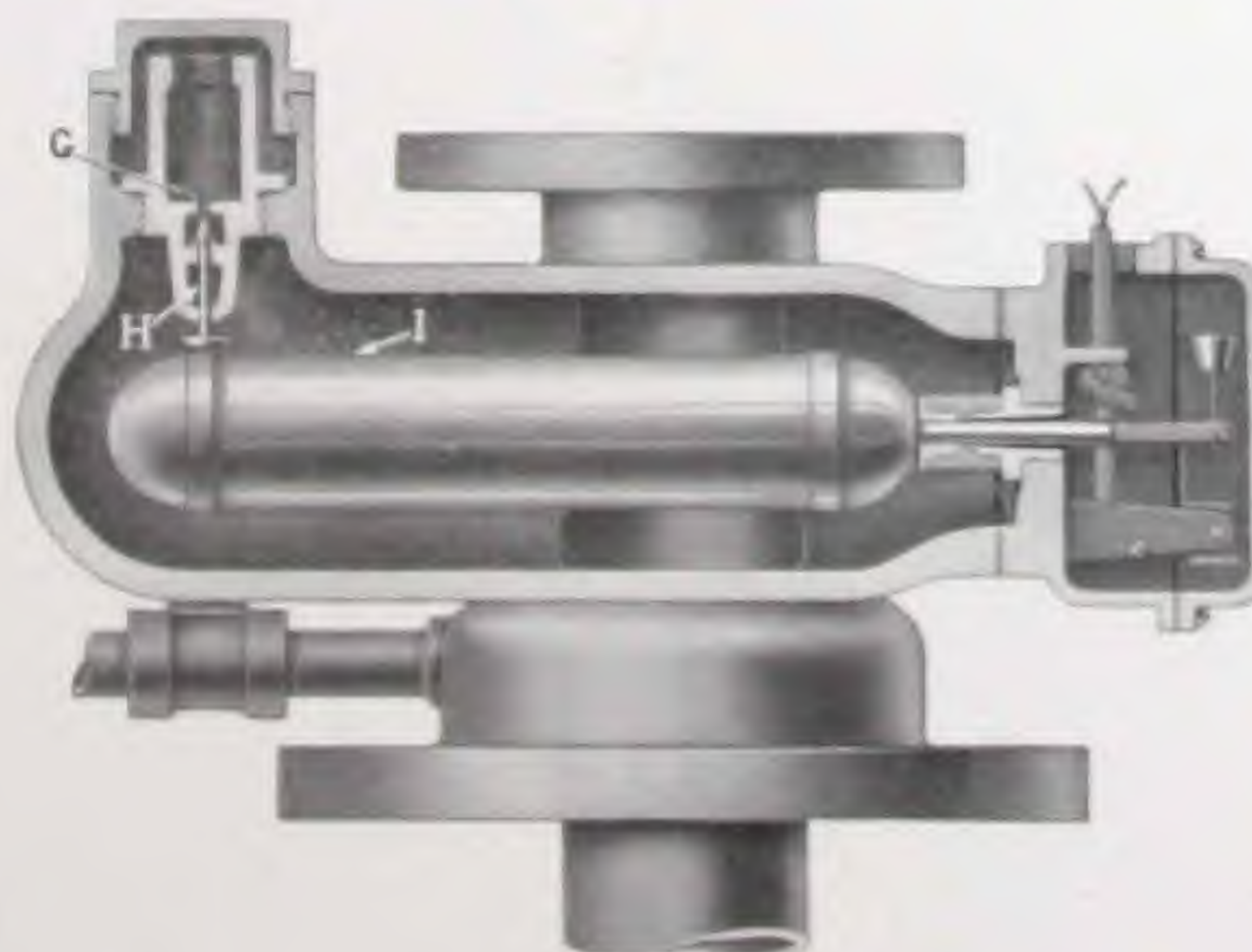
*Provides
Fire Alarm*

When a sprinkler head operates, the air is suddenly released from the system. The air from the tank cannot escape fast enough through the orifice to again equalize the pressure. This causes the air pressure in the tank to force water into the Simplex Fitting (see Fig. 3). This water causes Float I to raise Needle Valve H and close the Restriction Orifice G. This action on the Float also causes a fire alarm to sound. The bottled up pressure in the tank then continues to force water out of the tank to the opened sprinkler or sprinklers. (Cont. on page 8)



*Simplex
Pressure
Tank and
Connections*

Fig. 2



*Simplex
Discharge
Fitting—
Cross
Sectional
View*

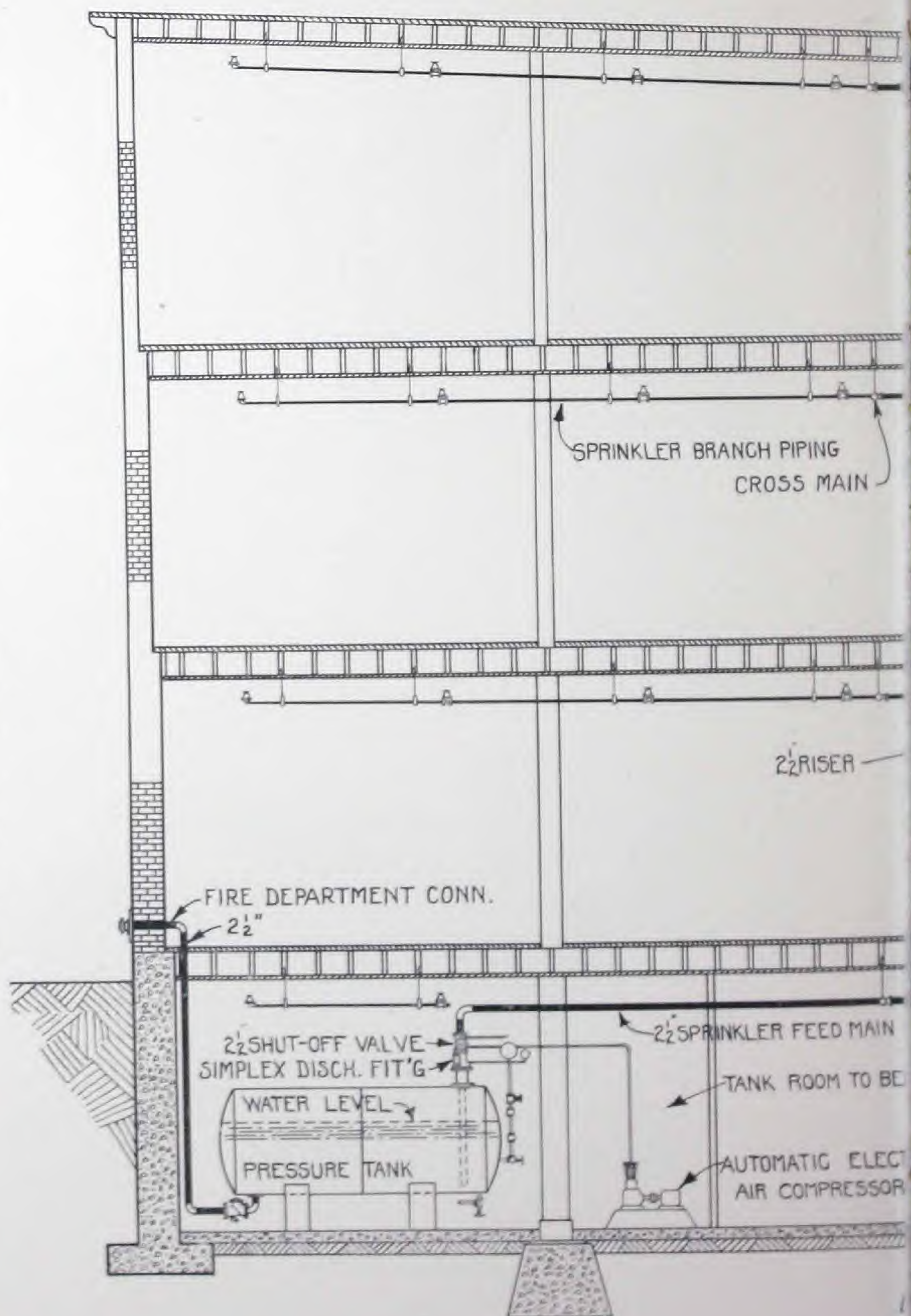
Fig. 3

CROSS SECTIONAL DRAWING OF GRINNELL SIMPLEX

The Simplicity of the
Features Are To

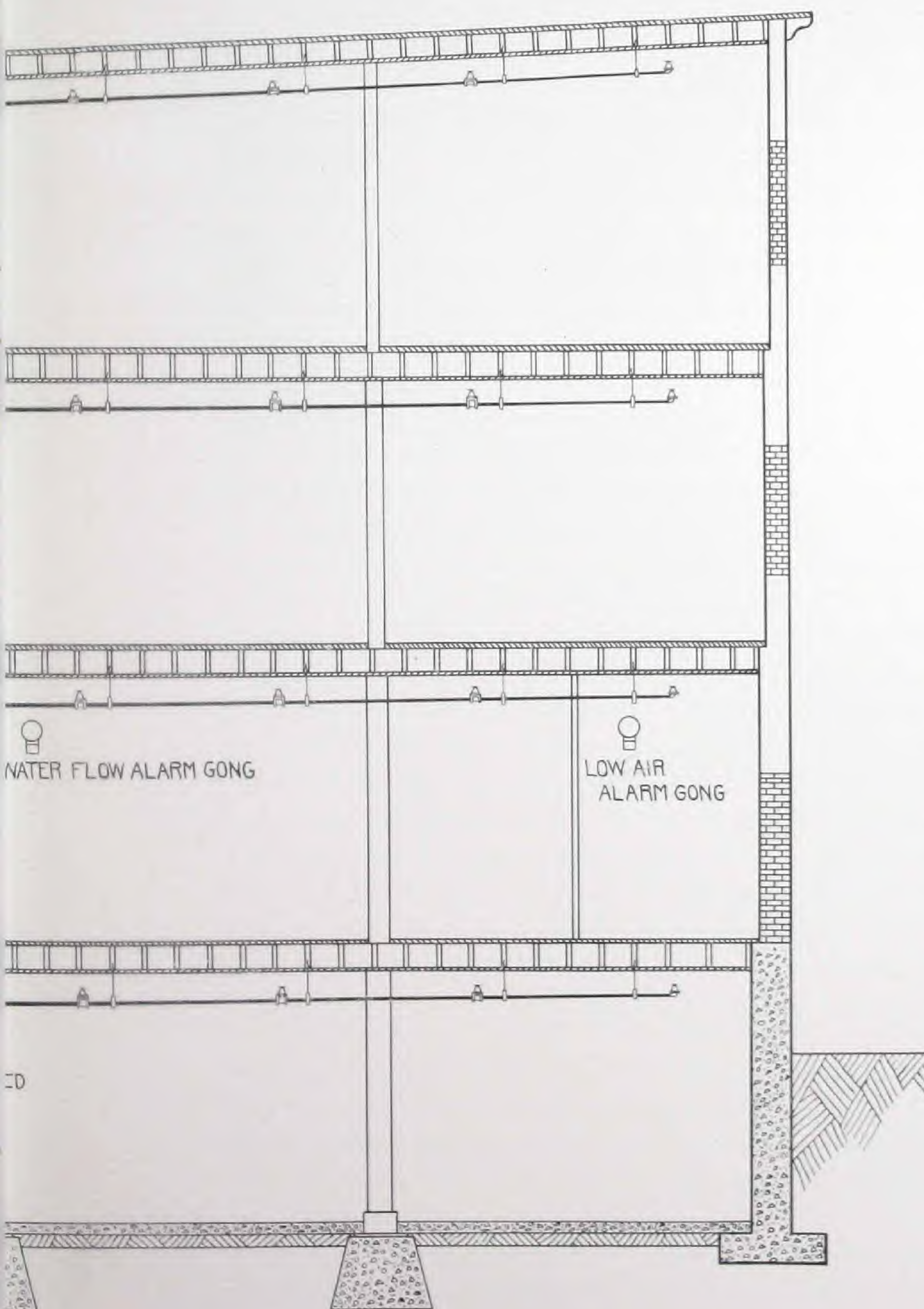
The cross sectional drawing on these pages shows the general layout for a Grinnell Simplex Dry-Pipe System. The compactness of the water supplies and air compressor shown in the lower left hand section of the building are to be particularly noted.

The tank is preferably to be located in the basement and enclosed so that the water can readily be kept from freezing by means of a small heater. This is easily possible in most buildings on account of the small space occupied.



SHOWING GENERAL LAYOUT X DRY-PIPE SYSTEM

Water Supply and Alarm
Particularly Noted.



It will be seen from the drawing that the largest pipe in the system is $2\frac{1}{2}$ -inches. This size pipe is sufficient to supply twenty operating sprinklers and since this system is only intended for use where ten sprinklers, or less, are expected to operate, there is no necessity for using any larger piping for either feed pipes or riser.

Even though the maximum pipe size is $2\frac{1}{2}$ -inches there is no limit to the number of sprinklers which may be installed on one floor or in one area. This is because the risks where this system is intended to be used are of light hazard where only a few sprinklers are expected to operate.

*Quick
Action*

This whole action is remarkably fast. In the tests made by the Underwriters' Laboratories, water issued from a sprinkler about 45 feet above and more than 100 feet away from the tank in 8 seconds; the alarm sounding in about 5 seconds.

*Quartz
Head
Increases
Speed*

The speed with which the water reaches the opened sprinklers is such that nearly all of the air in the system is trapped in the branch line piping so that practically all of the water in the tank is effectively discharged on the fire. With the much more sensitive Quartz head and this fast dry-pipe system operation, it is apparent that the Grinnell Simplex Dry-Pipe System will put water on a fire more quickly than a wet-pipe system using ordinary solder sprinklers. This trapping of air by the fast moving column of water up the riser has a further advantage in that it simplifies the drainage of the piping after operation, the small amount of water left in the system draining quickly back into the tank after having been forced from branch line piping by the trapped air pressure.

*Air
Pressure
Automatic*

The very simple operating principle of the system is, of course, dependent upon the maintenance of adequate air pressure at all times. This feature has been carefully safeguarded. First, by a simple and reliable automatic air compressor which operates just as soon as the pressure in the tank falls below a predetermined point and stops just as soon as the pressure is restored. Second, if, for any reason, automatic operation does not take place, the air pressure will continue to drop. This causes a low pressure alarm to be sounded through the medium of low alarm switch "C", Fig. 3.

*Simple
Maintenance*

After operation, the system can be drained and restored to operative condition by an untrained man following the simple instructions which are on a printed card in the tank room.

This type of equipment is the simplest that has ever been devised and where adequate city water is not

economically available or when maintenance is a problem, it will fill a long felt want.

The question naturally arises as to the kind of risk that can be protected by the Grinnell Simplex System. While it naturally would afford a considerable measure of protection to any property, its limited water supply indicates that it has been designed for the lighter hazards, where experience shows that fires are controlled by the operation of a relatively few sprinklers. In such risks this simple system will give practically the same protection as would be afforded by a standard equipment. In fact it is certain, in a great many fires in such risks, that this system will reduce losses as against standard systems due to avoiding useless water losses after the fire is out.

*Ample
Protection
Afforded*

The measure of protection afforded by this system in the lighter hazard occupancies may be quickly seen by referring to table (page 12) on the number of sprinklers operating and comparing that data with the following table of operating time with 1000 gallons of water in the tank.

<i>No. Heads Operating</i>	<i>Time of Effective Protection</i>
1	50 minutes
2	25 minutes
3	17 minutes
5	10 minutes
10	5 minutes

With quicker operation due to Quartz Bulb Heads, plus the splendid water distribution of the Simplex System due to high pressure, even better results than shown in the table on page 12 are to be expected. But figuring on experience with solder heads and varying pressures, it is obvious that in 94 percent of all fires 100 % protection is obtained for ten minutes or more, and the same protection for five minutes or more in all but 2 % of the fires.

*Provides
High
Water
Pressure*

With an unusually quick alarm, 100 % control for five minutes under the worst conditions to be expected in these selected risks is ample to bring in such outside aid as is necessary. In 80 % of the fires 100 % protection will be afforded for 25 minutes.

*Reasons
For
Present
Standards*

At their inception fifty years ago, automatic sprinklers were viewed solely and simply as a means of controlling incipient fires. So remarkable has been their record that today they are being depended upon not only to control fires of great size, but to stop exposure fires and even conflagrations. It is only in these latter aspects that there is any need for the large water supplies and pipe sizes that are required in standard systems.

*Few Heads
Stop Most
Fires*

The Grinnell Simplex System is based on the original conception of controlling fire in its incipency, i. e., by a few heads. The records of sprinkler fires during the past ten years shows clearly that in certain selected properties this means practically all fires.

If every fire in every class of risk, including the many extra hazardous industries, were considered, at least five minute protection would be afforded by the Simplex System in 84 % of all fires, and at least ten minute protection for 72 % of the fires.

*Hazard
Not Size
Controls
Use*

It, therefore, becomes obvious that the limiting factor in deciding where the Simplex System will give practically 100 % protection is the number of sprinklers that may be expected to open. Large areas are not objectionable with this system if the hazard is light. The whole problem is whether conditions are such that not over ten sprinklers are likely to open, and actual experience has quite clearly solved this problem. Selection based on this experience will have a large factor of safety due to the high pressure of the Simplex System and the greater sensitiveness of the Quartz Bulb Head which will be standard in such equipments.

SUMMARY OF MECHANICAL AND OPERATING ADVANTAGES

The following claims made when submitting the Grinnell Simplex Dry-Pipe System to the Underwriters' Laboratories for approval, summarize briefly the mechanical and operating advantages of the system:—

1. The object of this System is to extend the benefits of Automatic Sprinkler protection to properties where now, for physical or economic reasons, standard systems cannot be installed. Such reasons are, for example, lack of sufficient water supply, or prohibitive cost of such in relation to the value at risk.
2. Maintenance is exceedingly simple and upkeep low, there being no dry-pipe valve to set and keep in order.
3. The System is automatically kept in proper condition and once put into service should need no attention, except after a fire.
4. Failure to maintain proper air pressure during cold weather would not fill the system with water, with consequent damage thru freezing and long delay in putting back into service.
5. Water appears at the opened head with scarcely any delay, in this important respect the System being much superior to any dry-pipe system heretofore developed.
6. An alarm is likewise given very promptly on the occurrence of a fire.
7. The steps necessary to put the System into service being few and simple, this may be quickly done by inexperienced persons.
8. All the water in the tank is available for fire extinguishing regardless of the location of the opened heads, as any water trapped in the pipes is subsequently discharged at a useful pressure.
9. As all water is discharged there is no likelihood of freezing taking place during extremely low temperatures while the System is in operation or being set.
10. Condensation readily flows back into the tank and cannot cause water columning or damage by freezing.

Investigation of the Performance of Automatic Sprinkler Systems in Selected Properties

Class of Occupancy of Property	Extent of Fire Record	Total Number of Fires	Number of Fires— Control Not Satisfactory	Per Cent of Whole		Number Fires where over 10 Spk's Operated—Satisfactory Control	Number of Fires Eliminated (See Note)	Per Cent of Fires Controlled by:—			
				Satisfactory Control	10 Sprinklers or Less Operated			1 Sprinkler	2 Sprinklers or Less	5 Sprinklers or Less	10 Sprinklers or Less
	# 1	# 2	# 3	# 4	# 5	# 6	# 7	# 8	# 9	# 10	# 11
Apartments	Complete N. F. P. A. Sprinkler Fire Record	83	0	100	100	0	0	78	93	100	100
Club Houses		25	0	100	96	1	0	44	80	92	96
Hotels		78	1	99	92	1	2	70	88	96	100
Office Buildings		67	0	100	98	1	0	75	85	94	98
Institutions	Complete N. F. P. A. Sprinkler Fire Record	26	1	96	92	1	1	76	84	92	96
Schools, etc.		21	0	100	100	0	0	67	81	90	100
Restaurants		117	0	100	99	1	1	62	85	97	100
General Stores	Ten Year N. F. P. A. Sprinkler Fire Record 1918-1928	26	0	100	100	0	0	65	85	100	100
Mail Order Houses		34	0	100	100	0	0	59	79	94	100
Shoe Stores		53	0	100	100	0	0	55	81	98	100
Dry Goods		305	3	99	97	5	4	44	71	94	99
Misc. Mercantile		428	5	99	97	9	7	58	79	93	98
Hardware Stores	Ten Year N. F. P. A. Sprinkler Fire Record 1918-1928	96	2	98	96	2	2	57	76	87	98
Department Stores		305	3	99	95	12	7	52	77	94	97
Furniture Stores		77	4	95	92	2	4	47	74	90	97
Retail Groceries		33	0	100	94	2	0	64	79	85	94
Totals		1774	19	99	96	37	28	57	80	94	98
N. F. P. A. Percentages											
All Fires, All Classes				96	34	51	72	84

NOTE:—In determining percentages in columns 8 to 11 inclusive, all fires were eliminated where control could not be expected with any type of system, such as closed valves, important unsprinklered sections, systems out of service, severe exposure fires, defective dry-pipe valves, etc. All except such fires were controlled satisfactorily and the percentages in columns 8 to 11 inclusive show the results obtained after deducting the fires in column 7.

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